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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/742,306	12/19/2003	Chng Han Shen	APS03-003	5693

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EXAMINER

IM, JUNGHWAM

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 07/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/742,306

Applicant(s)

SHEN ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 12-21, 23-33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 6765299), hereinafter Takahashi in view of Yanagida (US 6204558).

Regarding claim 1, Fig. 1 of Takahashi shows a die, comprising:

a single substrate [101; supporting substrate];

two or more various shaped bump structures [106, 107, 116, 117] formed over the single substrate;

each of the two or more various shaped bump structures having a solder line; and

an epoxy layer [130] formed over the single substrate; the epoxy layer having a top surface.

Fig. 1 of Takahashi shows most aspect of the instant invention except “a) the solder lines are below the top surface of the epoxy layer; b) the solder lines are above the top surface of the epoxy layer; or c) some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top surface of the epoxy layer.” Fig. 1C of Yanagida shows a semiconductor device wherein the solder lines of the stacked solder bumps are above the top surface of the epoxy layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Yanagida into the device of Takahashi in order to have the solder lines of the stacked solder bumps above the top surface of the epoxy layer for easier soldering.

Regarding claim 2, Fig. 1 of Takahashi shows that one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

Regarding claim 13, Fig. 1 of Takahashi shows a die, comprising:  
a single substrate [101; supporting substrate];  
two or more various shaped bump structures [106, 107, 116, 117] formed over the single substrate;  
each of the two or more various shaped bump structures having a solder line;  
one or more of the two or more various shaped bump structures having a first height and one or more of the two or more various shaped bump structures having a second height that is less than the first height; and  
an epoxy layer [130] formed over the single substrate; the epoxy layer having a top surface .

Fig. 1 of Takahashi shows most aspect of the instant invention except “a) the solder lines are below the top surface of the epoxy layer; b) the solder lines are above the top surface of the epoxy layer; or c) some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top surface of the epoxy layer.” Fig. 1C of Yanagida shows a semiconductor device wherein the solder lines of the stacked solder bumps are above the top surface of the epoxy layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Yanagida into the device of Takahashi in order to have the solder lines of the stacked solder bumps above the top surface of the epoxy layer for easier soldering.

Regarding claims 3 and 14, Fig. 1 of Takahashi shows that the two or more various shaped bump structures have a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.

Regarding claims 4, 15 and 27, Fig. 1 of Takahashi shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a bar shape except “a width of from about 40 to 300 um and a length of up to about 3000 um.” However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a bar shape with a width of from about 40 to 300 um and a length of up to about 3000 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 5, 16 and 28, Fig. 1 of Takahashi shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a round shape except “a diameter of from about 40 to 300 um.” However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a round shape with a diameter of from about 40 to 300 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

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Regarding claims 6, 17 and 29, Fig. 1 of Takahashi shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a rectangular shape except “a width of from about 40 to 300 um and a length of from about 300 to 3000 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a rectangular shape with a width of from about 40 to 300 um and a length of from about 300 to 3000 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 7, 18 and 30, Fig. 1 of Takahashi shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a rectangular shape except “a width of from about 100 to 200 um and a length of from about 350 to 1200 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a rectangular shape with a width of from about 100 to 200 um and a length of from about 350 to 1200 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 8, 19 and 31, Fig. 1 of Takahashi shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a square shape except “a width of from about 40 to 300 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a square shape with a width of from about 40 to 300 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 9, 20 and 32, Fig. 1 of Takahashi shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a square shape except “a width of from about 100 to 200 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a square shape with a width of from about 100 to 200 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 10, 21 and 33, Fig. 1C of Yanagida shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a circular shape except “ an outer diameter of from about 100 to 2500 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a circular shape with an outer diameter of from about 100 to 2500 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are

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disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 12, 23 and 35, Fig. 1C of Yanagida shows that the epoxy layer is comprised of thermosetting resin (col. 6, line 29-30).

Regarding claim 24, Fig. 1 of Takahashi shows that the two or more various shaped bump structures have two sets of heights.

Regarding claim 25, Fig. 1 of Takahashi shows a die, comprising:  
a single substrate [101; supporting substrate];  
two or more various shaped bump structures [106, 107, 116, 117] formed over the single substrate;

each of the two or more various shaped bump structures having a solder line;  
the two or more various shaped bump structures having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape; and

an epoxy layer [130] formed over single the substrate; the epoxy layer having a top surface.

Fig. 1 of Takahashi shows most aspect of the instant invention except “a) the solder lines are below the top surface of the epoxy layer; b) the solder lines are above the top surface of the epoxy layer; or c) some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top surface of the epoxy layer.” Fig. 1C of Yanagida shows a semiconductor device wherein the solder lines of the stacked solder bumps are above the top surface of the epoxy layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Yanagida into the device of Takahashi in order to have the solder lines of the stacked solder bumps above the top surface of the epoxy layer for easier soldering.



Regarding claim 26, Fig. 1 of Takahashi shows that one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

Claims 11, 22 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi and Yanagida as applied to claims 1, 13 and 25 above, and further in view of Degani et al. (US 6734539), hereinafter Degani.

Regarding claim 22, the combined teachings of Takahashi and Yanagida show most aspect of the instant invention including at least one of the two or more various shaped bump structures has a square and/or rectangular shape, however, fail to show that at least one of the two or more various shaped bump structures is employed as an RF shield or a Faraday cage. Fig. 11 of Degani shows a bump structure [111] is employed as an RF shield or a Faraday cage (col. 7, lines 36-49).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Degani into the device of Takahashi and Yanagida in order to have at least one of the two or more various shaped bump structures employed as an RF shield or a Faraday cage to reduce the noise.

### ***Response to Arguments***

Applicant's arguments filed May 11, 2006 have been fully considered but they are not persuasive. The rejection stands, modified only to accommodate the amendments made to the claims by Applicant. New rejections are made in response to Applicant amended claims. In addition, the examiner presents the remarks below in response to Applicant's arguments.

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Applicant mainly argues that the amended portion of “a single substrate” would make the instant invention distinguished over the prior art. However, it is pointed out that the Takahashi reference still reads on the claims. Note that the instant invention recites “a single substrate; two or more various shaped bump structures over the single substrate.” Fig. 1 of Takahashi shows a single substrate 101 and two or more various shaped bump structures 106, 107, 116, 117 *over the single substrate 101*.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

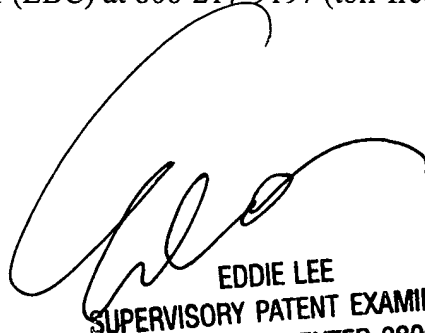
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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